

Elena in Costa Rica, 22 miles, and landward 12 or 13 miles to the head of Salinas Bay or Elena Bay. The Gulf is well named, for the land breeze—papagayo—is prevalent, at least at some seasons of the year, from Corinto, Nicaragua, well down the Costa Rican coast, often getting away beyond the zephyr stage in this region.

There are three secondary extensions of the Gulf of Papagayo—Salinas Bay, Elena Bay, and Playa Blanca Bay. The shore of Salinas Bay forms a regular curve from Arranca Barba Point at the northwest entrance to Point Sacate at the southwest entrance. These points are $2\frac{1}{2}$ miles apart, and the bay extends landward about 4 miles. The northern shore is high and bold, but the eastern and southern shores consist of sandy beaches separated by low bluffs. Salinas Island is situated not far from the center of the bay.

There are one shore station in the sandstone on the south shore of the bay and several dredging stations between Salinas Island and the mouth of the bay, in sand or mud, none deeper than 20 fathoms.

The peninsula between Salinas Bay and Elena Bay has a sea front of $2\frac{1}{4}$ miles, from Point Sacate to Descarte Point. Elena Bay is wide open to the westward. The north shore extends southeastward for about 5 miles; the head (east shore), $3\frac{1}{2}$ miles across, consists of two smaller secondary bays; and the south shore extends for 11 miles almost directly westward to Punta Blanca, with but one break to form Port Parker, $4\frac{1}{2}$ miles from the point.

Port Parker is an excellent landlocked harbor, but is not large, 2 miles long, 1 mile wide. The cliffs that guard the entrance on both sides do not extend to the head of the bay, for from the southern shore sand and mud flats extend outward for some distance. Collecting has been done on the rocky shore of a small island at the entrance of the port, and on the sand beach at the head coral masses have been collected; there are several dredging stations in 2 to 30 fathoms, in mud, sand, and shell.

Punta Blanca is a long point separating Elena Bay from Playa Blanca Bay. "This bold and striking headland projects to the westward, its rocky sides rising abruptly from the water to the sharp and jagged summit, which, at about a mile within the point, is 681 feet high."

Playa Blanca Bay is shaped much like Elena Bay, but is not nearly so large. The entrance between Punta Blanca and Cape Elena is 6 miles wide. The north shore to the head of the bay is 2 miles, and the south, or southeast shore, 6 miles. The head of the bay is a sandy beach; the remainder of the shore is rocky. There are one shore station in shale, one

for coral masses, and several dredging stations in 2 to 40 fathoms in a variety of bottom, mostly from the head of the bay along the north shore, out past Punta Blanca, but there is one near Cape Elena. The dredge hauls in the mud and dead shell were not very productive.

Cape Elena is a conspicuous, long, narrow, rocky ridge, like Punta Blanca, rising high, abruptly from the water's edge. South of Cape Elena, the Gulf of Culebra, larger than the Gulf of Papagayo, extends 32 miles to Cape Velas. Within the gulf and forming the head of it is an open bay, not named on the charts, 16 miles long and 7 miles wide. The north shore of the gulf is bold and hilly, but the remainder of the coast, in general, is relatively low. There are several small sandy beaches. On the north shore, between Cape Elena and the entrance to the inner bay, there are two small bays, wide open toward the south, Murcielago Bay, containing the Bat Islands and the Little Bat Islands, and Potrero Grande Bay, free of islands. Appearing as extensions of the southern portion of the inner bay, there are a number of small bays, the most important of which is Port Culebra; "the finest harbor in Central America is spacious, secure, and easy of access, with depths sufficient for the largest ships." The entrance to the southwest, 1 mile wide, lies between Mala Point, to the north, and Buena Point, to the south. Inside the entrance, it increases in width to 2 miles or more; the head is 4 miles from the entrance.

Off Point Mala are the North Viradores, two rocky islets, the outer of which has a conspicuous rocky column 60 feet high.

Although Buena Point is at the immediate entrance to Port Culebra, it might be considered that the southeast shore extends beyond this point to Cacique Point, 2 miles farther out, off which are the South Viradores, three small grass-covered islets that stand out similarly to the North Viradores to guard the entrance to the port.

Although the harbor is safe and secure, the papagayo that blows up during the day may make the surface choppy enough to materially disturb small boats. The coast here supplies a good example of the way in which the arid cactus-laden, sea-swept points lead inland to well-wooded surfaces or even good grazing land.

Shore collecting has been done along the slough on the south shore, on the rocks at Mala Point, Buena Point, and Cacique Point, dredging from the head of the bay, where mollusks and echinoderms are dominant, to out past the South Viradores, in depths of 20 fathoms or less. The bottom varies, there being mostly sand, mud, and shell at the head of the bay and sand, shell, and rock farther out, with a greater variety of species. Coral masses were obtained from near Point Mala.

Southwest of Cacique Point there is a small bay, $1\frac{1}{2}$ miles wide, Cocos Bay, at the head of which is a port of entry. There is one dredging station near the head of this bay, in 2 fathoms, sand and shell.

The southwest extremity of Cocos Bay is Miga Point, and beyond it is Gorda Bay, extending 4 miles to Gorda Point, the southwest extremity of the inner bay. Southwest of Gorda Point is another point (unnamed) $2\frac{1}{2}$ miles away, off which are the Brummel Islands, and the Catalina Islands, farther out. From this point to Cape Velas, 10 miles, there is a bight extending at the head to two smaller bays. This is the southern limit of the papagayos.

From Cape Velas, the coast, not quite regular, extends for 30 miles south-southeastward to Guionos Point, then east-southeastward, 21 miles, to Quinones Point, and from this point, much the same distance south-eastward to Cabo Blanca, at the western entrance to the Gulf of Nicoya.

Much of the coastal area around the southern half of the Gulf of Culebra and on to Cape Velas is lower than the coast of Costa Rica, farther north, but after Cape Velas it becomes hilly again. Most of the shore line is bolder and there are few sandy beaches. There are no inlets of importance between Cape Velas and Cabo Blanca.

Cabo Blanca serves as a striking landmark, for here the coast turns and turns again so abruptly that a well-marked peninsular headland is formed. The point rises rapidly, so that within one mile it has an elevation of 1,200 feet. This height is kept with little change to form a tableland extending inland for 6 miles, after which there is a receding slope to a lower plain. Isla Blanca lies one mile south of the point.

Gulfo de Nicoya (Gulf of Nicoya) is a large body of water, 34 miles wide at the entrance, between Cabo Blanca and Punta Judas, extending into the land, first northward and then northwestward, 52 miles. From Cabo Blanca the shore extends northeastward 23 miles to Negritos Island, largely as a series of small bays, often with sandy shores, separated by rocky points. From Negritos Island to the head there are numerous islands and much shoal water off the shore. That is true to some extent of the northeast shore as well, but it is not carried to the same extreme. Punta Arenas, a 4-mile, slender tongue of land extending westward, separates the inner part of the gulf from the outer. Near it is the port of entry, Puntarenas, near which the water is too shallow for any but quite small boats.

From Punta Arenas to Herradura Point there is a long bight, from which the shore passes southeasterly 10 miles to Punta Judas, a bold point

and headland, not so conspicuous as Cabo Blanca. Off this point the heavy breakers make it one of the principal danger points of the coast.

There are no dredging stations in the Gulf of Nicoya or its vicinity.

From Punta Judas the coast takes a long sweep, southeast and south, 73 miles to Llorena Point, the greatest depth of the bight being 21 miles. In general, the coast is bold from the water's edge or near it; but, even when it is low, it soon reaches an area of elevation to a chain of coastal mountains, higher than any others so near the coast for a long distance to the northwest. They are so near the shore that for some distance out at sea they hide the really high mountains farther inland. Mount Walker is 12,413 feet high. There are no very distinct irregularities in the shore of the bight.

Llorena Point is the western extremity of a large peninsula that separates the Gulf of Dulce, to the westward, from the open sea. The point itself is high and steep, and from it the coast extends 14 miles southeasterly to Sal Si Puedes Point, and then eastward for 18 miles to Matapalo Head at the entrance of the Gulf of Dulce. Three points are high and rocky, but most of the coast between them is low and sandy. Except for a ridge extending inland between the first two points, which remains low for some distance inland, the hilly country is not very far from the shore.

The Gulf of Dulce extends northward and then northwestward for 28 miles, with a width of $8\frac{1}{2}$ miles at the entrance between Matapalo Point and Banco Point, and within the entrance varying from 5 to 11 miles. The west coast is low, with hilly country near; the head is bolder, but the hills are farther from shore. These appear again in the northern portion of the east shore, but soon disappear again, so that the southern portion is low. There are depths of over 100 fathoms in the gulf, unusual for the Central American coast. There are several small, secondary bays and plenty of good anchorages. Collecting has been done on the shore among the large basaltic boulders near Matapalo Head by dipping under the cargo light and by dredging near by in 10 to 40 fathoms, sand and mud.

From Banco Point, or perhaps more correctly from Platanal Point, 3 miles to the southeast, there is another wide bight, this time a very shallow one, extending to Punta Burica, 24 miles from Platanal Point, with practically no sign of any smaller irregularities in the coast line.

Punta Burica is the terminus of a 15-mile, narrow peninsula, extending almost directly southward, only 2 miles wide a short distance from the point and 6 miles wide at the base. At this point Costa Rica meets

Panama. There is a small island, Isla Burica, lying about $\frac{1}{2}$ mile off the point and connected with it by a reef.

Before leaving Costa Rica, it might be well to consider one of its island possessions, Cocos Island, $5^{\circ} 32'$ North, 87° West, which lies 280 miles to the southwest of Burica Point and approximately twice that distance due west of Cape Corrientes, Colombia. Cocos Island is roughly rectangular, with the long axis northeast-southwest. Its greatest length is slightly over 4 miles and its greatest width over 2 miles, the circumference 13 miles. On the north coast there are two definite bays, Chatham and Wafer, but the remainder of the coast is regular. It is everywhere bold and quite precipitous. The whole island is covered with dense, tropical vegetation, as there is an abundance of moisture, with streams of water descending to the coast. One emptying into Wafer Bay is readily observed from the sea. The greatest height is reached in a peak, 2,788 feet high, near the west coast. There are several small islands near shore, the largest of which is Nuez Island, off Colnett Point, the northern tip of Cocos Island, at the western extremity of Chatham Bay.

Chatham Bay, which affords the best anchorage, is an indentation at the northeastern portion of the island, between Colnett Point and Pitt Head. Wafer Bay occupies the central portion of the northwest coast.

Three visits have been made to Cocos Island. Shore collecting has been done on the rocks, in the fresh-water stream; and by cargo-light dipping has been done in Chatham Bay. Collecting has been done on the rocks, in shingle, in fresh water, and in tide pools in Wafer Bay. Dredging has been done in Chatham Bay in shallow water, sand, and, farther out, off Nuez Island in coralline. There is only one dredging station in Wafer Bay.

Lying east of the peninsula that ends at Punta Burica, extending 30 miles to Isla Partida and landward 16 miles, is Bahia Charco Azul (David Bay). The western shore of the bay is high, but the northern shore is low and cut by several rivers. Isla Partida is the farthest seaward of an archipelago of deltas, large and small, 22 miles east and west and 15 miles north and south, at the mouths of the estuaries of several Panamanian rivers.

Eastward and southeastward of the archipelago is a sweep of coast line, over 40 miles to Punta Guarida, at the entrance to Bahia Honda. The coast is low like that adjacent to the archipelago, with estuaries and bays but with few deltas or other islands.

Panama and the Canal Zone

Plates 82-86; Charts 79-82

Southeast of the archipelago, 20 miles, is another small archipelago, but the islands here, Secas Islands, are rocky and irregular. Only two of them are large enough to be called islands, but besides these there are numerous islets and rocks. They are dotted over an area $5\frac{1}{2}$ miles north and south and 3 miles east and west. They are arranged to form a rough crescent, with the concavity toward the east. Three visits have been made to these islands and 20 collecting stations established, at which much good material has been obtained. The interior of at least one of the islands has been explored, and as one result a land iguana, 5 feet 3 inches long, was obtained.

On the shore rocks, reefs, and tide flats have been inspected and some good coral masses obtained. There have been dipping by electric light and dredging in several locations, nowhere in more than 25 fathoms, with a variety of bottom, sand, mud, coralline, nullipores, and shell.

Farther west-southwestward, 23 miles, are *Islas Ladrões*, three rocky, barren islets. There are one dredging station 4 miles southeast of *Islas Ladrões*, in 54 fathoms, green mud, and another 15 miles east of these islands and 10 miles southwest of *Secas Islands*, in 20 fathoms, gray mud.

Southeast of *Secas Islands*, 13 miles, there is still another archipelago, *Islas Contreras*, but these have not been visited.

The small, irregular *Isla Medidor* lies 2 miles to the northwestward of *Punta Guarida*, and a smaller island, *Isla Pacora*, to the south of this, with a narrow, rocky channel between. There are one dredging station north of *Medidor* and three between *Medidor* and *Pacora*.

Bahia Honda is an excellent harbor for vessels of any size, being deep, safe, capacious, and easy of access. The entrance between *Punta Guarida* and *Isla Centinela*, off *Punta Jabali*, is 1,750 yards wide, but inside the bay, the width reaches $3\frac{1}{2}$ miles. It is divided into two parts by *Isla Talon*, 1,350 yards long—the larger, *Bahia Chinche*, to the westward and the smaller, *Bahia Legamo*, to the eastward.

The shore is low and well wooded. Palm trees and bananas mark the position of single habitations, as well as that of the native village on *Isla Talon*.

Here there are shore stations in sand, rock, and rocky reefs, coral masses, dipping stations by electric light, dredging stations in depths of 5 to 35 fathoms on a variety of bottoms, but mostly on shell and nullipores.

The results obtained in the bay and near the entrance have not been so good as those from the channel between Medidor and Pacora islands.

Five miles off the entrance to Bahia Honda is Isla Canal de Afuera, and $6\frac{1}{2}$ miles southwest of this, the relatively large island, Isla Coiba, with a length of $21\frac{1}{2}$ miles and a width of 13 miles. South of the western part of the Isla Coiba and $3\frac{1}{2}$ miles from it is the triangular island, Isla Jicarón, $3\frac{3}{4}$ miles by 3 miles; and $\frac{1}{2}$ mile south of this again Isla Jicarita, 1 mile by $\frac{1}{2}$ mile. The northeast side of Jicarita is low and quite arid; the south shore is a perpendicular bluff and the west is much similar, although there are some small coves with a background of palm trees. There are one shore station on rock, with coral masses, on the northeastern part of the island, and dredging stations, one east of the northern part of the island, one to the west of the island, and one at the western entrance of the channel between Jicarita and Jicarón.

From Punta Jabalí southeastward there is a wide bight, extending 50 miles to Punta Mariato, with a large bay, Bahia Montijo, largely shut off from the open ocean by Isla Cebaco, extending northward 17 miles from the central portion. The first 15 miles of the shore of the bight is relatively rugged, but most of the remainder, especially that around Bahia Montijo, is quite low.

Punta Mariato is the southwestern point of a rectangular peninsula that lies between Bahia Montijo and the approach to the Gulf of Panama. The south shore extends 56 miles from Punta Mariato to Cape Mala, the southeastern point. The first portion is bold, but the remainder is low, although the deep water comes in quite close to the shore throughout the whole distance.

The west coast of the Gulf of Panama, extending from Cape Mala to the entrance to the Panama Canal, consists of two bights, a larger one, 25 miles across and 40 miles deep, and a much smaller one, 17 miles across and 8 miles deep, which forms the western part of Panama Bay. The whole coast is low, and the near-by water shallow. There are no significant, secondary irregularities.

South of the Balboa entrance to the Panama Canal, and 9 miles from it, are the two islands, Taboga and Taboguilla, 2 miles apart, with other islets and rocks in the neighborhood. Taboga is $2\frac{1}{4}$ miles long and $1\frac{1}{4}$ miles wide, almost divided into two parts by a cove on each side. Taboguilla is 1 mile long and $\frac{2}{3}$ mile wide. Both islands are wooded. Shore collecting in tide pools, on rocks, and on coral masses on Taboga and

dredging in shallow water, 5 fathoms as a maximum, have been the only activities here.

Balboa, situated at the head of the narrowed approach to the Panama Canal, is the Pacific port for the Canal Zone, a strip of land, 10 miles wide, extending across the isthmus of Panama to Cristobal on the Caribbean Sea. At Balboa there is a wide tide range, said to be over 20 feet at some of the spring tides. Some collecting has been done from the piles of the wharf at low tide.

Visits have been made to the laboratory on Barro Colorado Island in Gatun Lake, but the collecting here has been incidental. Some bats have been obtained from a cave near the Madden Dam.

Balboa, Canal Zone

Plate 84; Chart 82

Ashore there is no separation between Balboa and Panama City, but along the shore there is a point of land between the two, and Panama faces on Panama Harbor to the east of the city. It is something to see a real city, after leaving the last one, San Diego, so far behind. The fish market provided the only specimens obtained here.

Separating the present Panama Harbor from the harbor of the Old Town of Panama, destroyed by Morgan, is another small point of land. There are collecting stations on the rocks adjacent to the harbor of the Old Town.

From Old Panama the coast line forms a 75-mile crescent to Punta Brava, at the entrance to Bahia San Miguel. The coast is low, and, although there are several small bays and estuaries, the water is too shallow for them to be of much use in navigation. The water deepens gradually even some distance out from shore. The vegetation is now becoming more extensive, as this is the approach to the belt of tropical rain forests.

Lying off the southern half of this crescent, 10 miles as a minimum, is the Archipelago De Las Perlas, extending 30 miles north and south and 20 miles east and west. Isla del Rey, 15 miles long and $7\frac{1}{2}$ miles wide, is the largest of the group. There is no deep water between them and the mainland.

Bahia San Miguel, $14\frac{1}{2}$ miles wide at the entrance, between Punta Brava and Punta Garachiné, is very irregular, with bays and estuaries straggling off from it. It extends about 20 miles to the eastward. From Punta Garachiné the coast continues south-southeastward to Punta Piñas, 36 miles, with but one significant point, Punta Caracoles, along the way. The coast here is bolder, and the offshore water deepens rapidly.

Punta Piñas is at the tip of a slender, southerly projecting peninsula that serves as a perfect protection for Bahía Piñas, a small bay, $1\frac{1}{2}$ miles across at the entrance, extending northward for $2\frac{1}{3}$ miles, to form an excellent, safe anchorage. Here there are shore stations on rocks and in coral masses and dredging stations in 3 to 35 fathoms, in sand, mud, rock, shell, and coralline.

After Bahía Piñas the coast line continues the same general trend, 25 miles, to the Panama-Colombia boundary, and another 28 miles to Cape Marzo, at the entrance to Octavia Bay. Before reaching the cape, however, there is a definite indentation facing the northwest, Humboldt Bay.

Colombia

Plates 87, 88; Charts 83-87

Cape Marzo is bold and rocky, with a reef and detached rocks extending 3 miles south of it. It forms the western extremity of Octavia Bay, the coast of which extends northward, eastward, and southeastward to Point Cruces, 15 miles from Cape Marzo. The 2-mile northward extension of the bay is well sheltered. Collecting on the shingle and in the coral masses of the extending peninsula and dredging in 30 to 75 fathoms were the only activities here. In the shallower hauls there were sand and gravel, but in the deep ones only gravel and mud.

Point Cruces is much similar to Cape Marzo, at the tip of a southerly extending peninsula, with rocky islets offshore. It forms the western boundary of the Gulf of Cupica, extending 22 miles to Solano Point, but receding behind these points to form Cupica Bay to the north and Solano Bay to the south.

Cupica Bay is $5\frac{1}{2}$ miles wide and extends northward $3\frac{1}{2}$ miles. The peninsula to the west of it serves as an excellent shelter, and the anchorage is a safe one. There are one shore station here, on the inside of the rocky point, and one electric light station.

From Solano Point the coast line extends southward for 7 miles, to pass into another bight, extending 36 miles to Alusea Point. Fourteen miles from the north end of this bight there is a small fiordlike inlet, Port Utria, receding northward 3 miles, almost parallel to the coast. At the entrance it is but $\frac{1}{4}$ mile wide, but farther in it may be twice that. It is separated to the westward from the open sea by a high, narrow peninsula, with two islets and some isolated rocks off its extremity. It forms a safe, well-protected anchorage. The shores of the peninsula and

the islets are rocky, but the eastern shore of the port is mainly a sandy beach, extending outward to form a sandspit. Back of the shore the elevation increases rapidly; and, as this is well within the tropical rain-forest region, the hillsides are heavily wooded and the undergrowth is dense. Coconut palms, bananas, and papayas are grown in inhabited areas.

Port Utria has provided the stage for much endeavor. Three visits have been made to it, and 28 stations have been established in the vicinity. The shore stations are on the rocky shores of both the peninsula and the islands, and here too there are plenty of coral masses. In dredging in 10-50 fathoms the hauls made at and outside the entrance, and in the deeper water off the islands, were in mud; but nearer shore, outside the islands, and the channels between the islands, there are sand, shell, and rock, and here the fauna in evidence is much richer. Sea urchins and cake urchins are plentiful. Black and green sea snakes are very abundant.

The coast line from Alusea Point, 8 miles, to Cape Corrientes serves as the seaward face of a conspicuous, densely wooded promontory, with deep water coming close to shore. There is a 3-mile southern face to the promontory, east of which the coast turns north for a short distance to form the western shore of semicircular Cabita Bay, $3\frac{1}{2}$ miles wide and $1\frac{1}{4}$ miles deep. The high rocky coast ends with the peninsula, and the east shore is the beginning of a long stretch of low coast, with sandy beaches or mud flats and numerous estuaries. In the vicinity of Cabita Bay the jungle must reach nearly the maximum of impenetrability.

The rocky shore of the peninsula and the sandy beach at the head of the bay have provided some specimens, but any attempts at dredging have been largely abortive. The bottom consists of such finely divided mud or silt that it has not enough consistency to trip the bottom-sampler. Possibly no other place explored offered such poor marine collecting.

From Cabita Bay the coast passes directly southward and then slightly westward to Chirambira Point, on one of the islands in the delta of the San Juan River, 72 miles from Cape Corrientes. The main mouth of the river is 10 or 12 miles farther south.

Directly west of the mouth of this river, 250 miles, is the 1-mile long, barren, high, perpendicular rock, Malpelo Island. There are three solitary rocks exposed north of the island, North Rocks, and five south of the island, South Rocks. The island is a pinnacle, 846 feet high, above water, that comes up from the bottom of what otherwise is a sea, mostly more than 1,000 fathoms in depth. A landing has been made on this island to do some shore collecting, but no attempt was made at dredging.

South of the mouth of the San Juan River, for a long way, the type of the coast line changes but little. It is 20 miles southeastward to Buena-ventura Bay, 80 miles southwest from this, 35 miles westward, and 32 miles south-southwest to the entrance of Ensenada Tumaco, which is 23 miles wide at the entrance. It is 18 miles southwest of this, and then 14 miles southeast to the boundary between Colombia and Ecuador.

Ecuador

Plates 89-92; Charts 89, 90

Lying 16 miles off the islands in the delta of the Sangnianga River, in the western trend of this part of the coast, is Gorgona island, 5 miles long north-northeast and south-southwest, and $1\frac{1}{2}$ miles wide, with three noticeable peaks, the highest 1,296 feet. In its ruggedness, in its lush vegetation, and in its abundant precipitation, it bears some resemblance to Cocos Island.

Just a quarter of a mile south of Gorgona is the smaller island, Gorgonilla, about a mile in length, with a precipitous shore except for a palm-laden beach near its northwest point. La Roca, a saillike or shiplike rock, $1\frac{1}{2}$ miles south of Gorgonilla, is a conspicuous landmark that can be seen from the south for a long distance.

Three calls have been made at Gorgona Island, and 24 collecting stations established. The shore collecting has been largely confined to the north end and the east side, as far south as Watering Bay, some of it in the fresh-water stream there, mostly though on the rocks, and in the crevices and caves that abound around the northeast point. Coral masses are relatively abundant and easily obtained. For dredging, the east side of the island is not very good. The water deepens rapidly and the bottom is mostly mud, but not the silt variety near the mainland. Some mud brought up from 150 fathoms, northeast of the island, surely took the palm for real stickiness. North of the island, in rock and gravel, it is much better. Along the west side the water remains shallow much farther out, and in 30 fathoms or less the bottom is mostly shell. Sometimes the masses of shell are all dead and then the hauls are not so valuable. Farther south, toward Gorgonilla, the bottom is rocky, rough with corals, some of which may readily be seen in the clear, shallow water. In the channel between Gorgona and Gorgonilla the mud again appears.

From the Colombia-Ecuador boundary the coast extends southward, 80 miles, to Galera Point. Here the nature of the coast line begins to

show a change, but it is a very gradual one. An occasional cliff or bluff appears to break the monotony of the low, level shore, but there are still many estuaries, deltas, and mud flats.

Galera Point is the northwest point of a high, rocky promontory, extending southward 11 miles to Cape San Francisco. It much resembles the promontory at Cape Corrientes, but the face is convex rather than concave. It is the most northerly of the westerly projecting points in Ecuador. Behind the cape there is a bay, San Francisco Bay, which is much similar to Cabita Bay. There is a northern projection—a narrower, shallower portion, running farther inland. A small river, or stream, comes down to this portion, but at low tide is pretty well shut off from it by a sandbar. Near the mouth are clusters of graceful trees, outliers of the denser forests farther back. East of the mouth of the river is an extensive sand beach, behind which the native village of San Francisco is situated. Seining has been done in the mouth of the stream, and shore collecting on the rocky shore of the projecting peninsula. As in other places in this region, dredging in the mud is not effective. The only place to get worthwhile material is in shallow water over the reef, where dredging is anything but a smooth procedure.

From Cape San Francisco there is a wide bight, 65 miles, to Cape Pasado and then a less extensive one, 50 miles, to Cape San Lorenzo. The southern shore of the latter bight runs directly westward; and in it, 15 miles from Cape San Lorenzo, is the small indentation, Manta Bay, on which is located the town of Manta, the port for Montechristi, where the finest Panama hats are made. Coral masses have been collected in Manta Bay, and the rocky shores and the reefs have provided some material, but no dredging has been done in the vicinity.

La Plata Island lies 16 miles southwest of Cape San Lorenzo. It is $3\frac{1}{2}$ miles long, northwest to southeast, and $1\frac{1}{4}$ miles wide. It reaches a height of 615 feet, and, in general, the shores are precipitous, although there is a somewhat more gentle slope in a ravine that passes down to a beach on the east shore. It is quite unlike Gorgona Island, since much of it is arid, although there is enough vegetation to support some cattle and numerous white goats. Shore collecting on the rocks and dredging in 10-15 fathoms near shore, and in 45-55 fathoms farther out, in mud, indicate the activities here. The shallow-water dredging is quite profitable, but the deeper dredging is too reminiscent of the coastal areas immediately to the northward to be satisfactory.

Directly south of Cape San Lorenzo, 33 miles, with a bight in the coast intervening, is a point off which Salango Island lies. There is a bar between the island and the mainland, but there is good anchorage north-east of the island. The island is 2 miles in circumference, high and covered with luxuriant vegetation. There are four dredging stations in sand near the anchorage, but no shore stations.

Thirty-eight miles south-southwest of Salango Island is Punta Santa Elena. There is a deep bight between, the southern portion of which forms Santa Elena Bay. Its eastern limit may be considered to be Centinella Point, 11 miles from Punta Santa Elena, and its depth is 3 miles. It is all shallow, with seldom more than 10 fathoms of water.

Punta Santa Elena is the tip of an abrupt, bare hill, 424 feet high, abrupt toward the land as well as toward the sea, for the remainder of the shore is low. The village of Salinas is situated on the shore 2 miles east of the point, and La Libertad, the port of Santa Elena, 1 mile inland, is 4 miles farther east than Salinas.

The shore has been explored off La Libertad, off Salinas, and along the open coast south of Punta Santa Elena. It is a suitable area for diving and dipping by electric light. Dredging in the open part of the bay, in sand, provides little; off Salinas it is somewhat better, but the real thrill comes in dredging in rough, rocky bottom at the entrance north of Punta Santa Elena, where almost every class of marine organism may be represented in a single haul. Gorgonids, echinoderms, and mollusks are particularly abundant. Mantas appeared to be more abundant off the point than anywhere else in the eastern tropical Pacific.

Punta Santa Elena is the northwestern extremity extending southwestward, between Santa Elena Bay and the Gulf of Guayaquil. The southwestern shore between Punta Santa Elena and Cape Morrow, 58 miles, faces on the outer part of the gulf.

The Gulf of Guayaquil is very large as gulfs and bays along the Pacific coast of South America go. The entrance from Punta Santa Elena, Ecuador, to Cape Blanco, Peru, is nearly 90 miles across, and from this entrance line to the mouth of the Guayas River it is over 100 miles. At the entrance to the inner part of the gulf, from Morro Point to Payana Point, it is still 36 miles wide. In the gulf there are several islands, the largest of which is Puná Island, 29 miles long and 8 to 13 miles wide, which lies to the southeastward of the peninsula already mentioned. There is one shore station just north of the eastern point of the island,

near the Village of Puná, where pilots are taken aboard by ships going up the river.

There are some small islands lying off Salinas Point, the southwest tip of Puná Island, the most conspicuous of which is Santa Clara Island, 12 miles out, near the center of the channel. It is surrounded by reefs and breakers. The lighthouse on the summit of the island, 256 feet high, and the light itself at night are visible for 22 miles out to sea.

On more than one occasion the *Velero III* has gone across the gulf and up the River Guaymas 40 miles to Guayaquil, but these trips were side issues as far as marine collecting is concerned; so the route need not be considered here.

PLATE 69

- Fig. 148 The White Friars, Mexico, a series of guano-covered rocks located near Acapulco and the site of a tremendous bird rookery. (Photographed by Wm. R. Taylor.)
- Fig. 149 Morro de Petatalan, a conspicuous headland along the Guerrero Coast of Mexico and principal landmark in locating the White Friars, a series of bird rocks from which this picture was taken. The birds are Brewster's boobies. Chart 71, p. 405.

PLATE 70

- Fig. 150 Fresh-water lagoon at Sihuatenejo, Mexico, in which several species of fish were netted by the expedition of 1931. Chart 71, p. 405, Station 3.

PLATE 71

- Fig. 151 View of Acapulco Harbor, Mexico, showing *Velero III* in the center and *U.S.S. Wright* at anchor to the left. Chart 15, p. 373.
- Fig. 152 Narrow entrance to the landlocked harbor of Acapulco, Mexico.

PLATE 72

- Fig. 153 The harbor at Acapulco, Mexico, viewed from a promontory on the north side of the bay. The old fortress may be seen at the end of the peninsula in the middle distance. The city has built up considerably since the picture was taken in 1932. Chart 15, p. 373.
- Fig. 154 Salina Cruz, located on the Gulf of Tehuantepec opposite the narrowest point of the Mexican Isthmus, and Pacific terminus of the shortest railroad across Mexico. Chart 15, p. 373.

PLATE 73

- Fig. 155 Tangola Tangola Bay, Mexico, showing the sand beach and rock shingle on which marine collecting was accomplished. The bay is located at the northern limit of the Gulf of Tehuantepec. (Photograph by Wm. R. Taylor.) Chart 73, p. 405.
- Fig. 156a Chacahua Bay, Mexico, looking across the estuary of the lagoon toward the rocky promontory which provides such shelter as the bay affords. (Photograph by Wm. R. Taylor.)
- Fig. 156b Chacahua Bay, Mexico, seen from the southeast. The conspicuous head at the left is Pt. Galero, elevation 190 feet. The lagoon entrance lies immediately to its right. Chart 72, p. 405.

PLATE 74

- Fig. 157 These spectacular sea stacks occur off the northwest end of Clarion Island and are the remnants of a former continuation of the bluff to the right in a westerly direction. The largest is Monument Rock. Chart 47, p. 395.
- Fig. 158 Braithwaite Bay, Socorro Island, as seen from the deck of *Velero III*. Mt. Everman, elevation 3,707 feet, is seen in the right background. Chart 46, p. 395.

PLATE 75

- Fig. 159 The coral sand beach at Sulphur Bay, Clarion Island, Mexico, where Hancock Expedition members landed on the rocky spit shown at the left of the picture. Plant growth consists principally of cactus, although a few low trees offer nesting sites to birds. Chart 47, p. 395.
- Fig. 160 Clipperton Island, only coral atoll in the eastern tropical Pacific Ocean. A 65-foot rock resembling a ship rises from the shallow lagoon. A few coconut trees are the only life visible. Chart 14, p. 372.

PLATE 76

- Fig. 161 View of the volcano Viejo or Chinandega, elevation over 5,000 feet, located 17 miles from the city of Corinto, Nicaragua. The fringe of mangroves is characteristic of the Central American shore line of Guatemala, Nicaragua, and San Salvador.
- Fig. 162 Port Parker, Costa Rica, presents a barren aspect in the dry season. A further touch of desolation is added by the black patches which represent burned areas. Numerous brush fires were raging at the time of the visit of the Hancock Expedition of 1939.
- Fig. 163 Port Parker, Costa Rica, located well within the zone of *Papagayos*, or windstorms. *Velero III* scientists worked in the lee of the small island, which is one of a series of stacks joined to the north shore of the bay.

PLATE 77

- Fig. 164 The beach at Gulf of Dulce, Costa Rica, showing lava reefs which make surf landing perilous. The dense jungle contains a few trees of notable height. Chart 77, p. 407.
- Fig. 165 Expedition members shown accoutered for field work in photography, mammalogy, herpetology, and botany, and marine zoologists already at work on the volcanic rock shingle which juts into the Gulf of Dulce, Costa Rica, at Matapalo Head.

PLATE 78

- Fig. 166 Lava rocks extending into the surf at Matapalo Head, Gulf of Dulce, Costa Rica. (Photograph by Wm. R. Taylor.)
- Fig. 167 Precipitous shore of Cocos Island, Costa Rica. The island affords but two landing places, Chatham Bay and Wafer Bay. Except for the water courses, which are the natural highways throughout the island, the interior is difficult of access. Chart 78, p. 408.

PLATE 79

- Fig. 168 Fresh-water stream at Wafer Bay, Cocos Island, Costa Rica. It was here that seine hauls were made for fishes occurring in the brackish water resulting from the mixture of salt and fresh water with the incoming tide. Shacks of treasure-seekers are located to the right of the picture. (Photograph by W. L. Schmitt.)
- Fig. 169 The surf at Chatham Bay, Cocos Island, Costa Rica, showing Nuez Island in the right background.

PLATE 80

- Fig. 170 Nuez Island, a satellite of larger Cocos Island, Costa Rica. Both are covered with dense tropical vegetation of a brilliant green color. The picture is taken from the deck of *Velero III* anchored in Chatham Bay.
- Fig. 171 Estuary at Puerto Culebra, Costa Rica, showing punt used to negotiate the narrow channels, often overgrown with mangrove thickets. Chart 76, p. 407.

PLATE 81

- Fig. 172 Puerto Culebra, Costa Rica, seen from behind a dense growth of columnar cacti.
- Fig. 173 Skiff among coral heads exposed at an especially low tide on one of the islands of the Secas group, Panama, a favorite collecting ground for *Velero III* parties. Chart 79, p. 408.

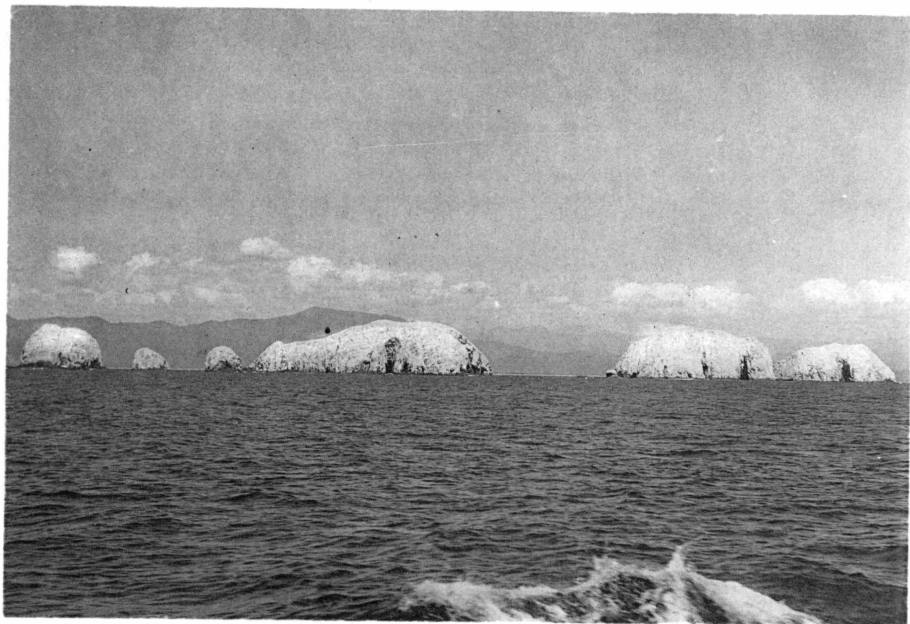


Fig. 148 The White Friars, Mexico

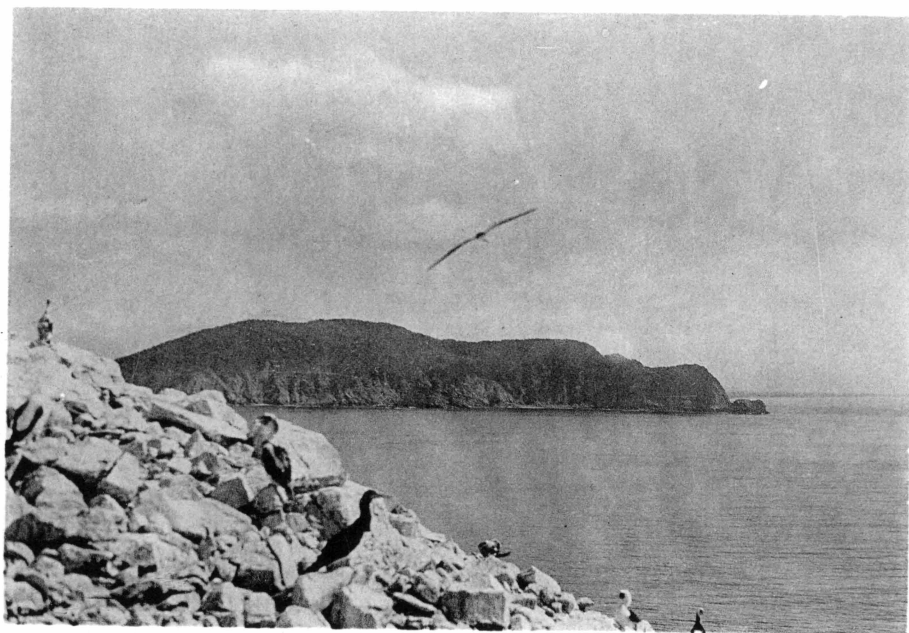


Fig. 149 Morro de Petatlan, Mexico

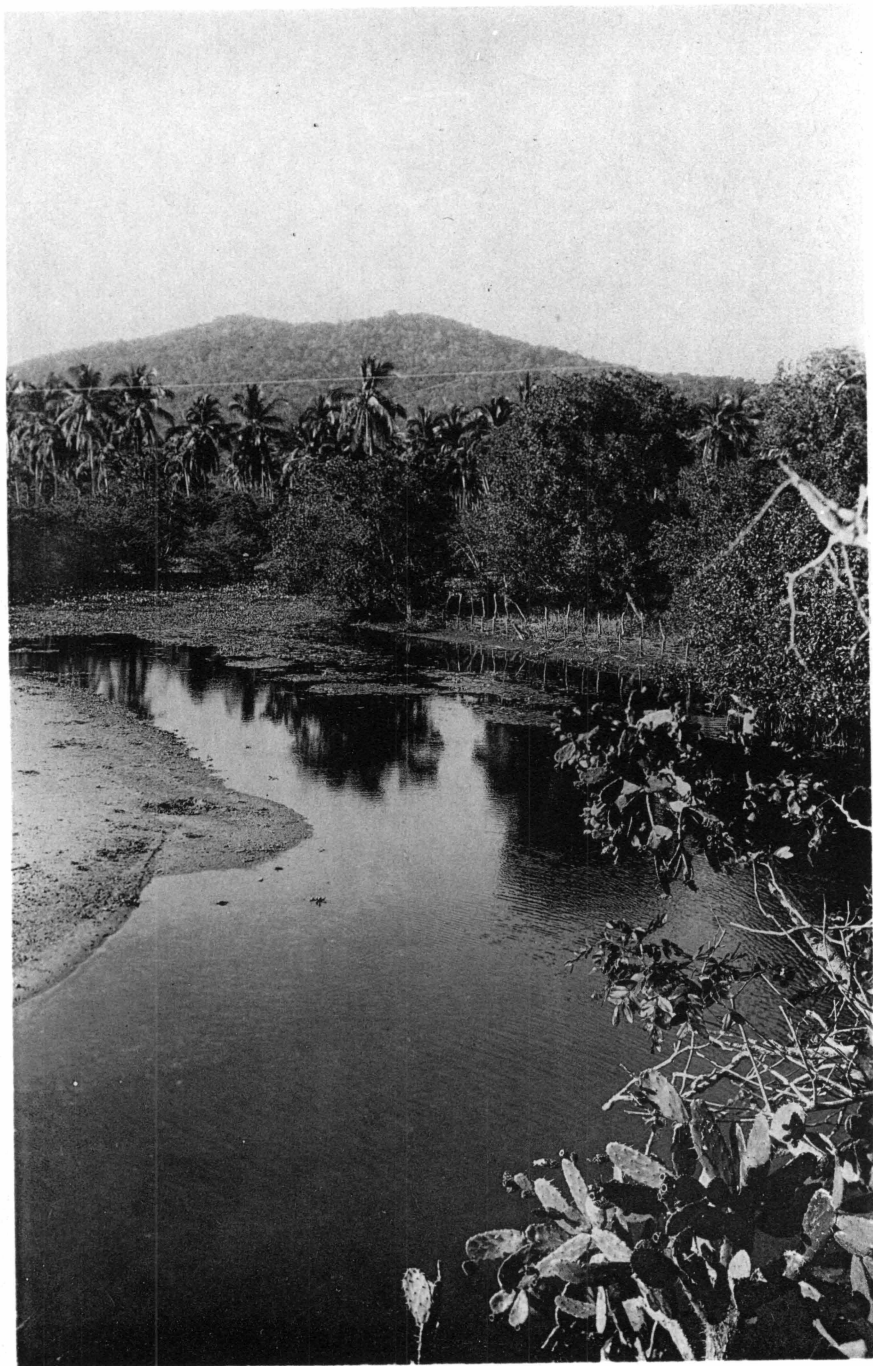


Fig. 150 Lagoon at Siuatenejo, Mexico



Fig. 151 Acapulco, Mexico, harbor



Fig. 152 Acapulco, Mexico, harbor

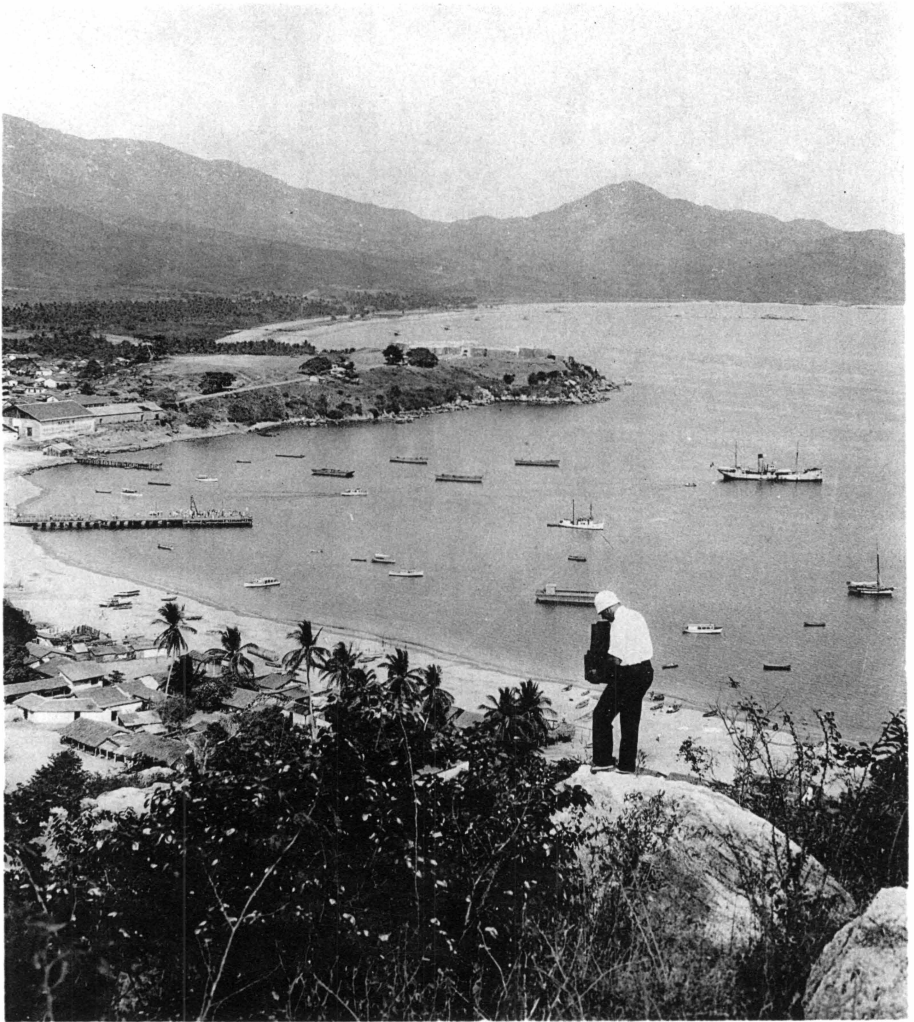


Fig. 153 Acapulco, Mexico, harbor

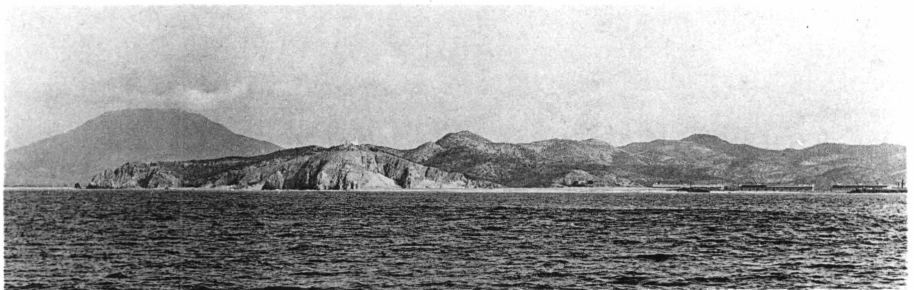


Fig. 154 Salina Cruz, Mexico

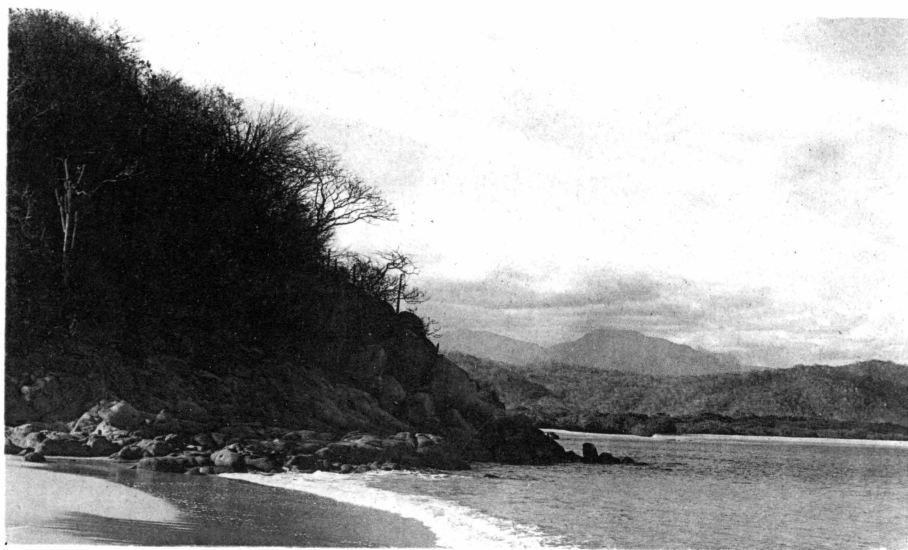


Fig. 155 Tangola Tangola, Mexico

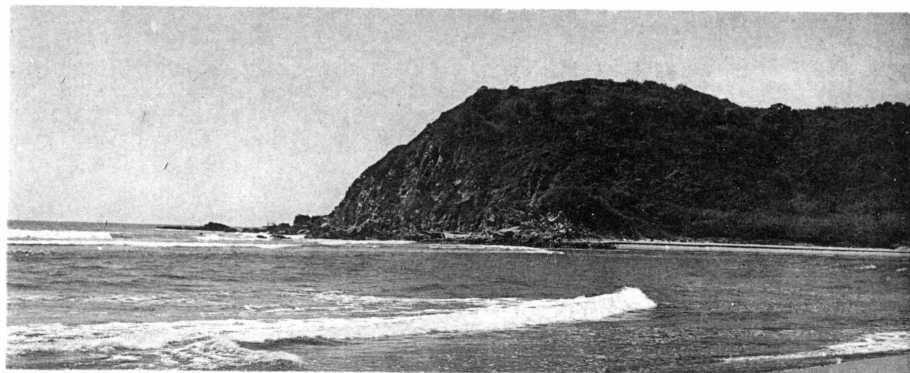


Fig. 156a Chacahua, Mexico, lagoon entrance



Fig. 156b Chacahua Bay

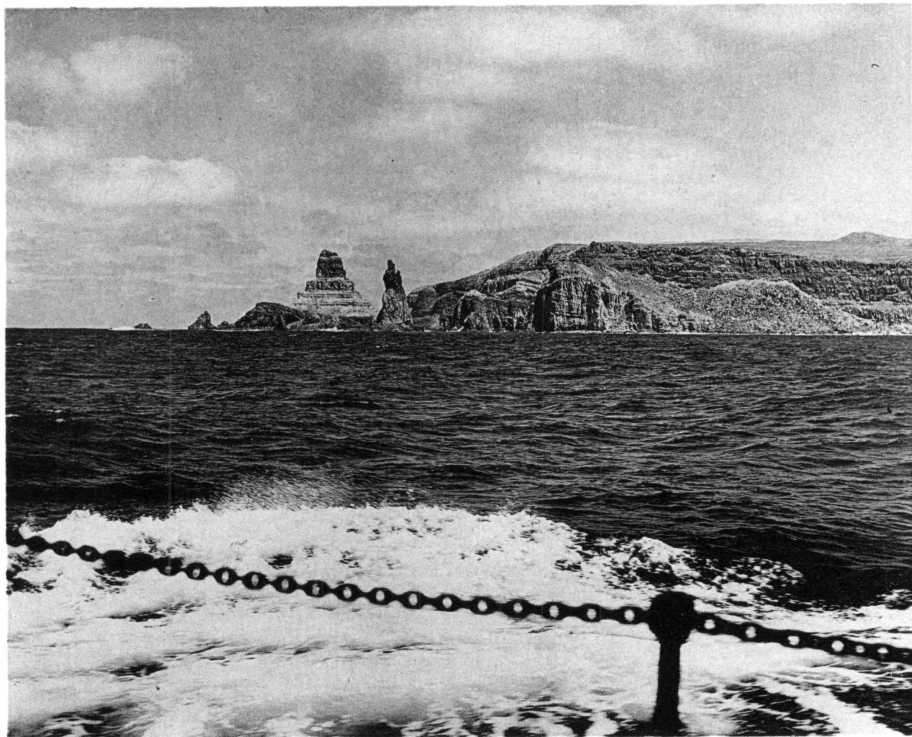


Fig. 157 Clarion Island, Mexico

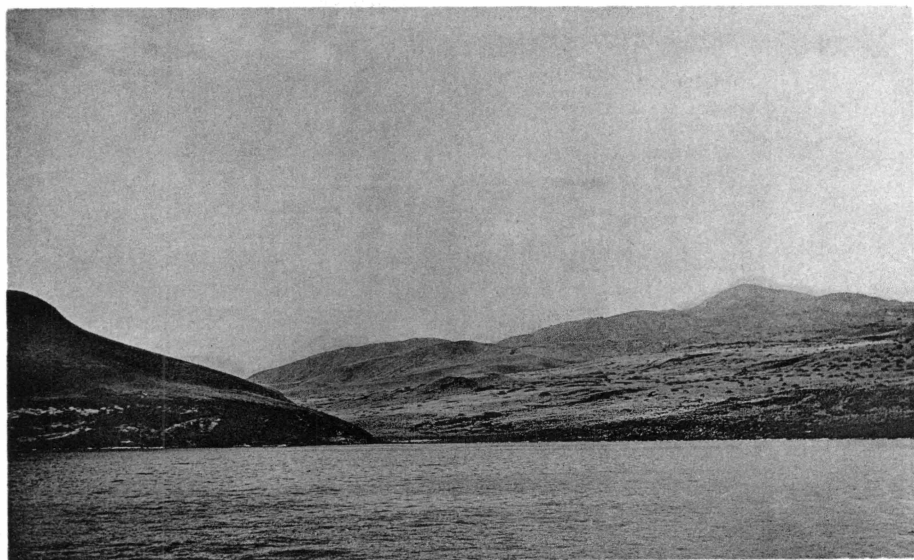


Fig. 158 Braithwaite Bay, Socorro Island, Mexico



Fig. 159 Clarion Island, Sulphur Bay

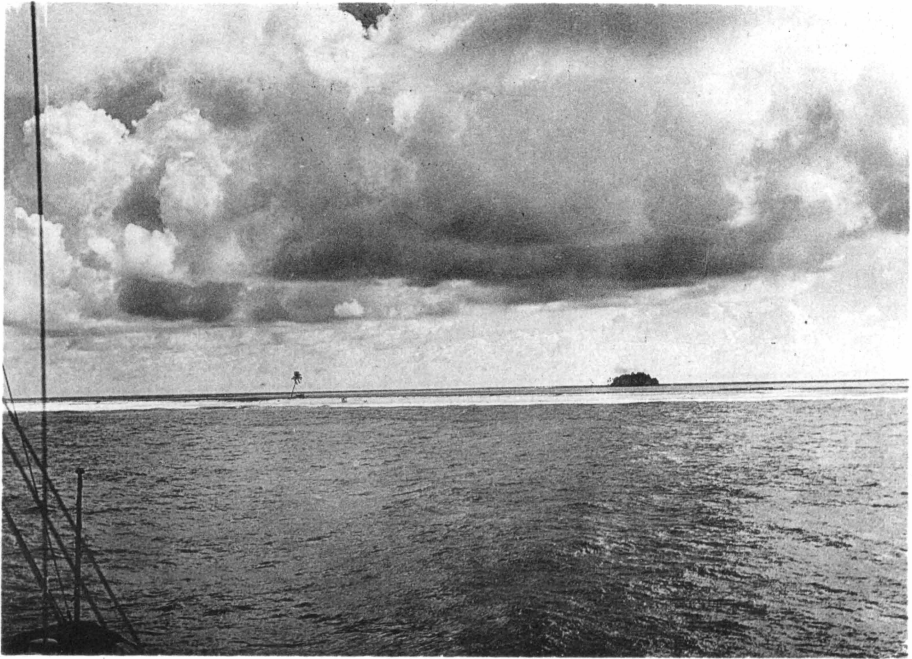


Fig. 160 Clipperton Island



Fig. 161 Volcano Viejo, Nicaragua



Fig. 162 Port Parker, Costa Rica



Fig. 163 Port Parker, Costa Rica



Fig. 164 Gulf of Dulce, Costa Rica



Fig. 165 Gulf of Dulce, Costa Rica

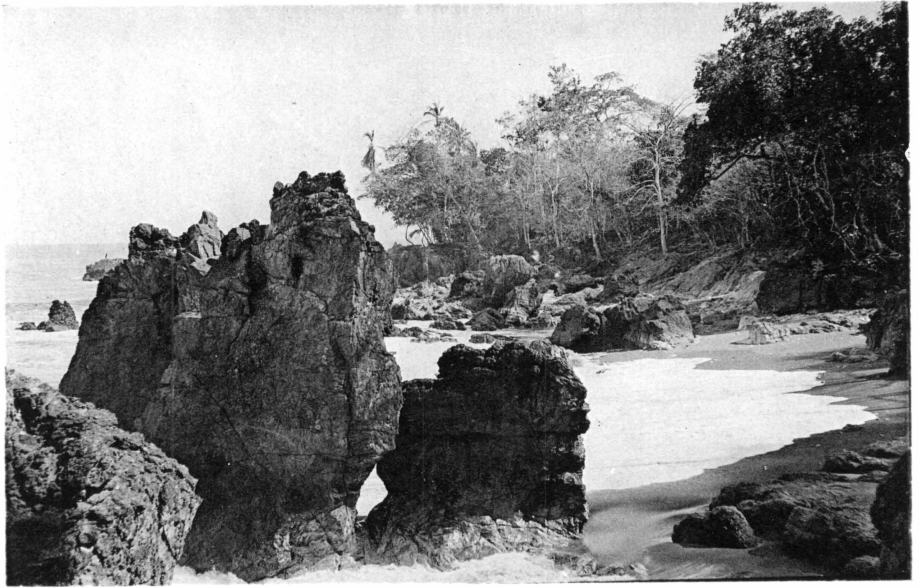


Fig. 166 Gulf of Dulce, Costa Rica



Fig. 167 Cocos Island, Costa Rica



Fig. 168 Wafer Bay, Cocos Island, Costa Rica



Fig. 169 Chatham Bay, Cocos Island, Costa Rica



Fig. 170 Nuez Island and Cocos Island, Costa Rica



Fig. 171 Puerto Culebra, Costa Rica



Fig. 172 Puerto Culebra, Costa Rica



Fig. 173 Secas Islands, Panama, coral heads

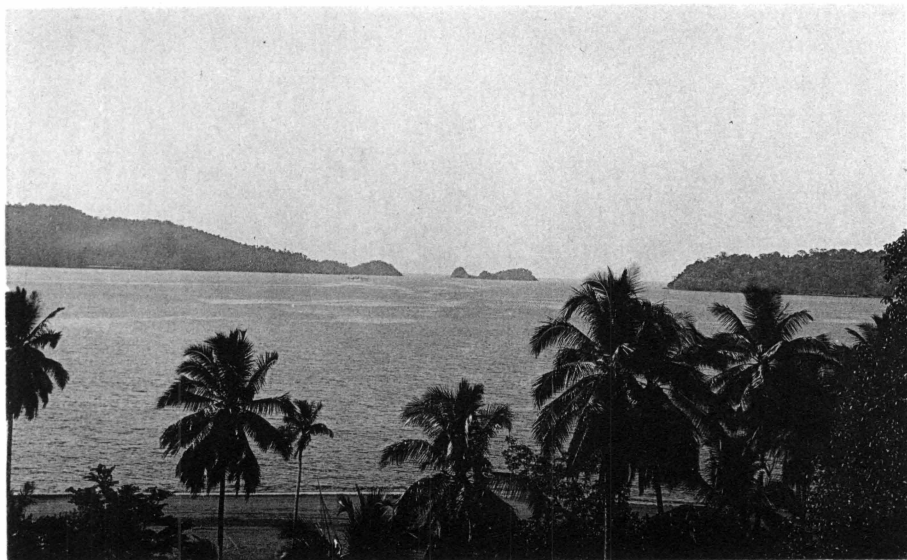


Fig. 174 Bahia Honda, Panama, seen from north shore



Fig. 175 Bahia Honda, Panama, north shore



Fig. 176a Panama, Jicarita Island

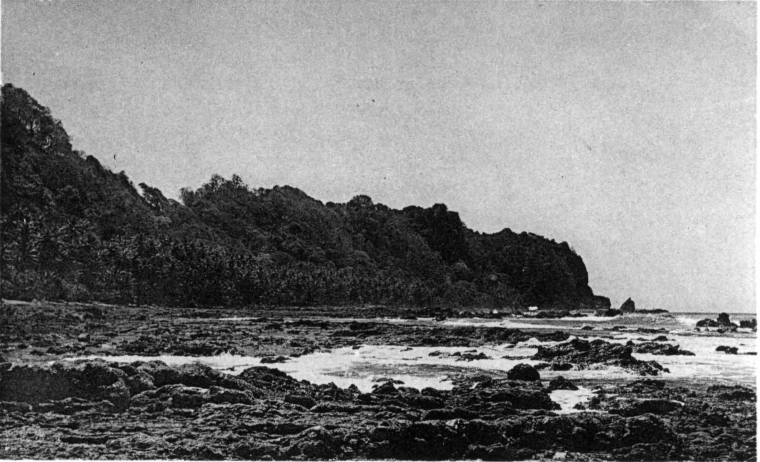


Fig. 176b Panama, Jicarita Island

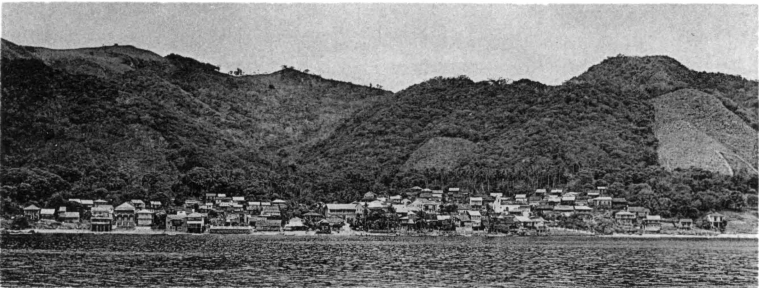


Fig. 177 Panama, Taboga



Fig. 178 Panama City, Panama



Fig. 179 Balboa, Canal Zone



Fig. 180 Gatun Lake from Barro Colorado Island

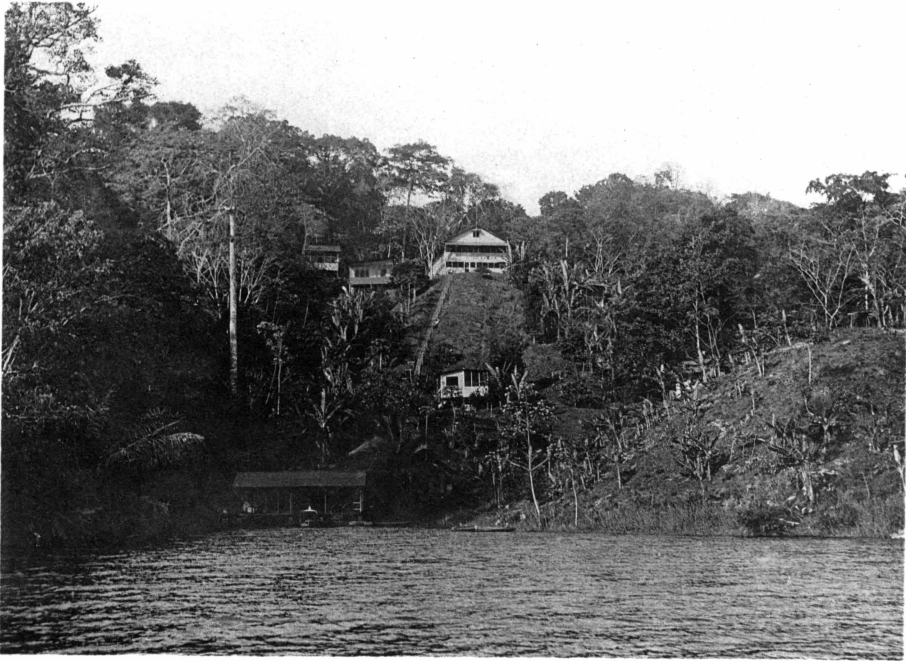


Fig. 181 Barro Colorado Island, Canal Zone



Fig. 182 (*left*) Piñas Bay, Panama
Fig. 183 (*right*) Piñas Bay, Panama
Fig. 184 (*below*) Malpelo Island, Colombia

